

CLAIMS

- Article 34  
Add A1
1. A device having a surface relief structure which has a plurality of regions, wherein the regions include grey scale regions which are too small to be separately resolvable to the human eye,  
5 each grey scale region being one of a limited number of different grey scale region structure types,  
the different grey scale region structure types appearing, by reason of their differing diffuse scattering characteristics, to have different intensities when the device is illuminated by a light source and viewed by an observer  
10 from any direction.
2. A device according to claim 1 wherein each grey scale region structure type has one or more graphic elements, line art or text images represented in microscopic size in its surface relief structure.  
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3. A device according to claim 2 wherein each microscopic region is of size 120 micron by 120 micron or less.
4. A device according to claim 2 wherein the same image is represented in  
20 each grey scale region structure type, but with differing diffuse scattering characteristics.
5. A device according to claim 2 wherein different graphic elements line art or images are represented in different grey scale region structure types.  
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6. A device having a surface relief structure which has a regular array of regions, each region being too small to be separately resolvable to the human eye, wherein a large number of the regions are micrographic regions with diffuse scattering characteristics, each micrographic region having one or more  
30 graphic elements, line art or text images represented in microscopic size in its surface relief structure so that each micrographic region appears to an observer to be a particular shade of grey when viewed from any direction.

7. A device according to claim 6 wherein each micrographic region has an identical image represented in its surface relief structure.
8. A device according to claim 6 wherein each micrographic region has a structure which is one of a limited number of micrographic region structure types.
9. A device according to any one of claims 1 to 8 wherein, when the device is illuminated by a light source and viewed by an observer, the observer sees in microscopic form an image which corresponds with a microscopic image represented in the surface relief structure of some or all of the regions.
10. A device according to any one of claims 1 to 9 further including a plurality of diffracting regions such that, upon illumination by a light source, the device generates one or more diffraction images which are observable from one or more ranges of viewing angles around the device.
11. A device according to claim 10 wherein non-diffracting regions provide a contrast-enhancing dark background to the diffraction image or images.
12. A device according to claim 10 wherein non-diffracting regions provide grey scale enhancement to the diffraction image or images.
13. A device according to claim 2 or claim 6 wherein some or all of the regions are hybrid regions which include both periodic surface structure which has diffractive effects and graphic elements line art or images which have diffuse scattering effects.
14. A device according to claim 13 wherein microscopic text is embossed onto or engraved into the tops of diffractive periodic surface structure elements and/or between diffractive periodic surface structure elements.

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15. A device having a surface relief structure which has a plurality of light scattering regions, each region having a number of structures which scatter incident light in different directions, so that the region appears to an observer to be a particular shade of grey when viewed from any direction.
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16. A valuable document incorporating a device according to any one of claims 1 to 15 wherein printing on the valuable document matches up with, and appears to be continuous with regions on the device which have a printed appearance.
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17. A device according to any one of claims 1 to 15 which is used for authentication purposes, wherein authentication of the device takes place by microscopic examination and recognition of the regions.
18. A device according to any one of claims 1 to 15 which is used for authentication purposes, wherein authentication of the device takes place by machine recognition of the regions.